STATION ASSEMBLY SET TO RESUME

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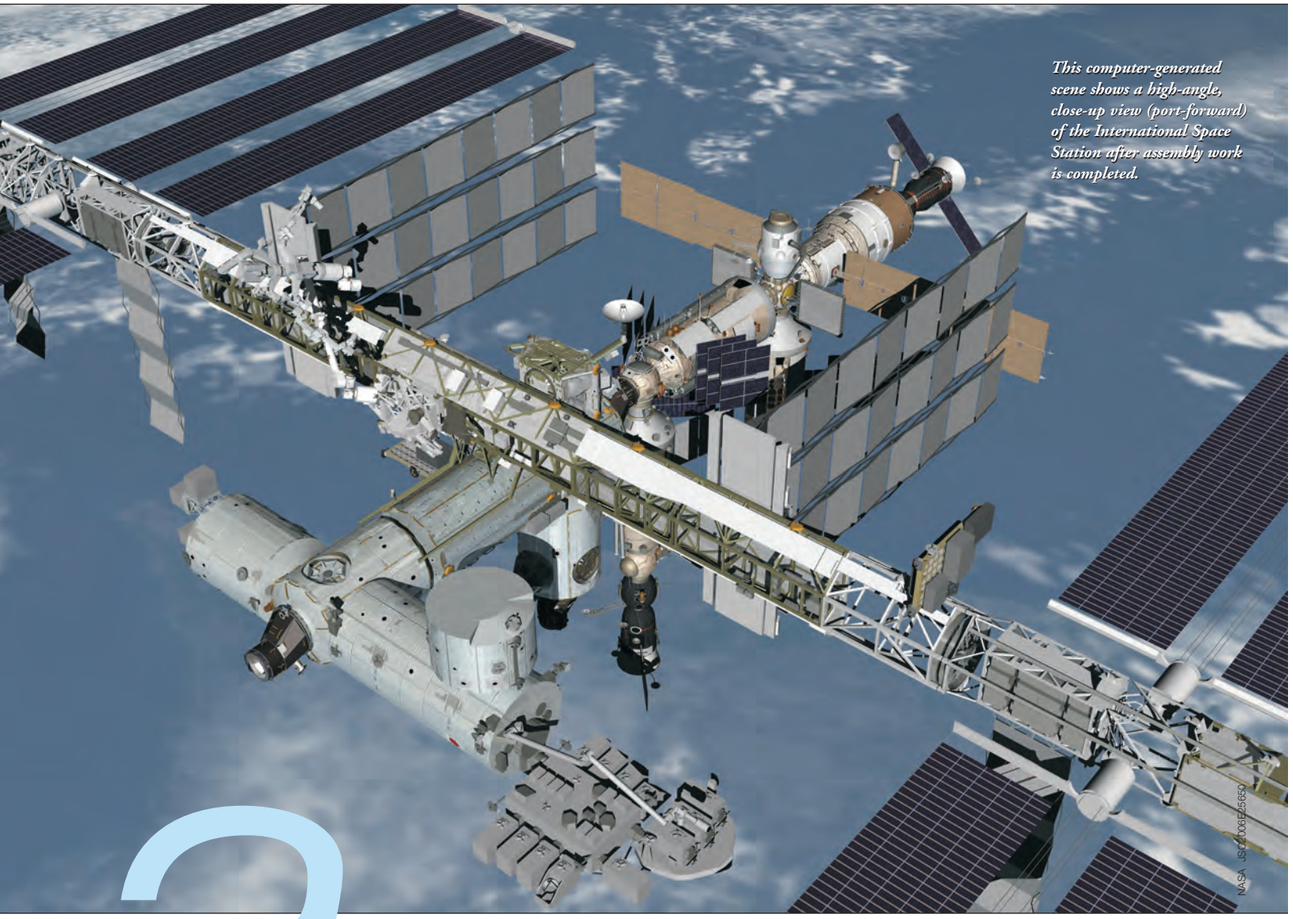
by Catherine E. Borsché



This computer-generated scene shows a high-angle, close-up view (port-forward) of the International Space Station after assembly work is completed.

NASA JSC2006E25650

As *Discovery* coasted back to Earth, concluding another successful Return to Flight mission, STS-115 began ramping up to begin another milestone—the continuation of International Space Station assembly efforts.

The conclusion of the STS-121 mission psychologically signaled a new phase of the space program. STS-121 astronaut Piers Sellers reflected on the magnitude of the mission's achievements following the crew's first spacewalk.

"There were two things I was expecting: 1) that the shuttle would fly with no problem—we would have a clean vehicle and 2) we would leave the space station in a good station and pick up assembly sequence. We would start again and continue assembly," Sellers said. "We're fixed and ready. We're two for two."

The space station has been in a holding pattern while NASA concentrated on making the shuttle safer to fly after Columbia. It has been a challenge and a learning experience for the International Space Station Program to keep the station operating and ready to resume assembly at any moment, but now there is much hope on the horizon. While NASA continues to test the space shuttle on each mission, it has a bigger mission to carry out along the way.

"Really, (STS-) 115 is the return to the assembly sequence, and I think that's significant," said STS-115 Commander Brent Jett. "We have a mandate to finish the station by 2010 and retire the shuttle. We need to shift from Return to Flight mode back to a more operational assembly sequence."

This next mission will catapult the station into a new era of construction. The 18-ton P3/P4 truss segment to be deployed during STS-115 will greatly change the exterior look of the station and nearly double its power-generating capabilities.

"On the port side (of station), we've already got P1, which is the port number one truss element, and we're going to add the port three and four, which attach to it," said STS-115 Mission Specialist Dan Burbank. "The business end of this truss segment is a set of solar arrays that are much like the ones we already have on the very top of the space station right now, and these will extend out to 240 feet and give you the capability of generating a lot of power from the sun's energy."

In the near term, the station will be getting a much-needed boost of energy, but there are other exciting changes in store for future assembly missions.

In the latter part of 2006 and into next year, shuttle visits will facilitate the building of the station's "backbone" with truss segments and solar arrays. Power and plumbing systems will be rewired to a permanent configuration. The Node 2 module—the piece that will connect the European and Japanese experiment modules—will be delivered. The European Space Agency (ESA) will also launch its first in a series of automated vehicles that can ferry 7.5 tons of cargo to the station.

Once the backbone of the station is well underway, international partners will begin adding their own unique elements to bring the station to another dimension as a research platform.

"We're all chomping at the bit to get this construction going again," STS-115 Mission Specialist Joe Tanner said, calling the station "a house that's only partially built" at this point. Tanner spoke highly of the modules that are scheduled to be launched and installed soon.

"The Japanese module is a beautiful science platform. I've had a chance to work with those engineers and see the module, and it's really magnificent," he said. "The European module, Columbus, is going to be fantastic. Node 2 is sitting at the Cape (Canaveral), ready to go, and needs to be launched. I think it's a great shot in the arm for everybody in the partnership to [say], 'Okay, let's get going again, and let's finish this job that we started out.'"

When ESA's Columbus laboratory module is installed, it will provide room for researchers on the ground, aided by the station crew, to conduct thousands of experiments in life science, materials science, fluid physics and other fields in a weightless environment.

The Kibo Japanese experiment module will provide a storage room for experiments, maintenance tools and supplies, as well as a high-tech laboratory that will focus on space medicine, biology, Earth observations, biotechnology, communications and more. Its Remote Manipulator System, or robotic arm, will allow astronauts to interact with experiments on the outside of the station.

And that is just the tip of the iceberg for the space station, which will more than triple its state-of-the-art research facilities from its current configuration. The volume and mass of the station will also more than double from its current size.

Station experiments and research have already yielded invaluable scientific advances, such as the use of medical ultrasound as an on-orbit diagnostic tool—a development with many applications on Earth.

Not only that, but building this special laboratory can be seen as one of humanity's greatest achievements, especially when considering the international partnerships involved. Even though the program must be prepared to deal with unexpected challenges, NASA is doing all it can to plan for contingencies and maintain a realistic view of the tremendous task at hand. Completing the station will require immense effort and coordination, but the benefits will far outweigh the difficulties along the way.

"The International Space Station is a learning platform for our future exploration goals," said Space Station Program Manager Mike Suffredini. "Once we complete construction on the station, NASA will be able to set its sights even higher and use the knowledge gained from our research to make possible what was previously considered impossible."

NASA JSC2006E40249

The International Space Station U.S. Node 2 module is placed into an Airbus Beluga heavy-lift aircraft. Node 2 will provide a passageway between four space station science experiment modules.

NASA JSC2003E34758

The Kibo Japanese Experiment Module's Pressurized Module, a space station-bound science laboratory, is lowered into a crate in preparation for shipment to Kennedy Space Center. Modules like Kibo will enhance the station's future research capabilities.

Spacewalks essential to STS-115

by Brad Thomas

Astronaut Joseph R. Tanner waves to his cabin-bound crewmates during an STS-97 spacewalk.

NASA STS097-703-011

The STS-115 mission, which will resume the on-orbit construction of the International Space Station, promises to be challenging. Space Shuttle *Atlantis* and its six-member crew will deliver a truss segment and set of solar arrays, increasing the station's ability to create power.

Crucial to the installation of these new components are the three scheduled extravehicular activities (EVAs), or spacewalks. A mixture of veteran and first-time astronauts will make the journey and get the job done.

Commander Brent Jett, who has flown on three previous shuttle missions, will be joined by Pilot Chris Ferguson, a rookie astronaut. Mission Specialists Dan Burbank and Joe Tanner are veteran astronauts with experience at the station. Two more mission specialists—first-time crew member Heidemarie Stefanyshyn-Piper and Canadian Space Agency (CSA) astronaut Steven MacLean—round out the crew.

MacLean, who has one shuttle mission under his belt, will become the first Canadian to operate the station's CSA-built robotic arm. He will use the arm to connect the P3/P4 truss to the P1 truss.

The group has been training since 2002. Much of the preparation has been centered on the mission's spacewalks, which will be conducted by two different teams: Tanner and Piper will perform the first and third spacewalks, with Burbank and MacLean conducting the second one.

The first two spacewalks will occur on back-to-back flight days and will be devoted to preparing the truss for solar array deployment. The spacewalkers will connect power and data cables between the P1 and the newly installed P3/P4 segments and release locks and launch restraints.

Tanner said that the first spacewalk will include tasks similar to activities he performed during STS-97, but that STS-115's second excursion features new tasks.

"Dan and Steve, on EVA 2, have their work cut out for them. These are activities that we've never done before," said Tanner. Everything that we do on EVA 2 is brand new."

On flight day 6, the new photovoltaic solar arrays are scheduled to be deployed. The deployment will take place in six-inch increments to allow for the proper thermal conditioning of the array blankets. Also, the arrays will be deployed at high tension to avoid the motion that occurred when the station's first set of arrays was deployed during STS-97.

"The deploy day is going to be very dramatic—onboard, in the control room and visually, I believe, for the people who watch the station go over at night," Tanner said.

Then on flight day 7, Tanner and Piper will conduct the mission's third spacewalk. The major tasks will be to attach the solar array radiator for deployment, retrieve a material science experiment from the station's exterior and perform antenna installation.

Once fully operational, the 240-foot arrays will increase the station's power capability. The 82 active array blankets contain a total of 16,400 individual silicon photovoltaic cells to convert sunlight into electricity.

The P3/P4 truss also features a device called the Solar Alpha Rotary Joint (SARJ). This new joint will be joined to the end of the P5 truss once it is delivered during STS-116 and the P6 truss after it is relocated during STS-120. The SARJ can rotate 360 degrees to position the P4 and P6 solar arrays to track the sun for electrical power generation.

Tanner said the SARJ will help the station be more efficient in collecting energy.

"The attitude of the station, of course, is adjustable, but some attitudes are more favorable from a propulsion point of view and a control point of view," Tanner said. "You really want the solar arrays pointing at the sun—perpendicular to the sun's rays—so that you can get the maximum collection of energy."

Jett said the addition of the P3/P4 truss and the other segments of the truss are important for the future assembly of the space station.

"The entire reason we are building the truss on the station is to get these power modules up there and to provide the power for the European laboratory module and the Japanese laboratory module," said Jett. "They all link together into finishing the station and meeting our obligations to our international partners."

Once completed, the Integrated Truss Structure will span more than 300 feet and carry power, data and environmental services for the station.

In addition to the truss work, the STS-115 crew is slated to inspect *Atlantis*' heat shield and deliver supplies and equipment to the orbital outpost.

Piper said excitement is building with the launch drawing near.

"I am getting very excited as we're getting closer, especially because of the fact that we've waited for so long for this flight," she said. "Now that we're getting closer and closer it's … sinking in that the job is not training for flight, but the job is actually to go fly. And that's something we are going to do. We are going to go fly."

NASA /Markowitz JSC2002E44130

Canadian Space Agency (CSA) astronaut Steven MacLean

NASA/Blair JSC2002-01927

Mission specialist and veteran astronaut Dan Burbank

NASA /Markowitz JSC2005E13783

First-time crew member Heidemarie Stefanyshyn-Piper